

K2 Observations of Solar-Like Planet-Hosting Stars in Field 0

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Characterizing planet-hosting stars to get as accurately as possible their masses, radii, and ages is essential to infer the properties of their exoplanets. Planetary mass and radius are only measured relative to the host star, while the age of the star is the best proxy for the age of its planets. Asteroseismology is the best tool to provide accurate stellar masses, radii and ages. The original *Kepler* mission was indeed based on this complementarity. **K2 offers a unique opportunity to characterize by asteroseismology planet-hosting stars outside the original *Kepler* field.** These seismic observations will be essential for future exoplanet missions like CHEOPS that will not do asteroseismology, and that will have some key targets in K2 fields (e.g. WASP-12b, see below). **K2 is also the tool of choice for exoplanet studies.** K2 observations of transiting planets (3 in Field 0) will allow accurate measurements of their radii that, combined with the mass, will put tight constraints on their internal composition.

We identified in K2 Field 0 four solar-like planet-hosting stars that should, according to our SNR computations for 80-day K2 observations, yield detection of oscillations. Given the ~ 5 min pulsation periods expected, **short-cadence observations** are needed:

- **HD50554** (103.678437, 24.245561, $V=6.86$): F8 star, with a Jupiter-like planet ($5.16 M_{\text{Jup}}$) in a large orbit ($P_{\text{orb}}=1293\pm 37$ d). No transits discovered so far.
- **HD45652** (97.304967, 10.933891, $V=8.1$): G8 star, with a $0.47 M_{\text{Jup}}$ planet on a $P_{\text{orb}}=43.6$ d orbital period. No transits discovered so far.
- **HAT-P-24** (108.825083, 14.262608, $V=11.82$): F8 star, with a transiting hot Jupiter planet: $0.68 M_{\text{Jup}}$, $1.23 R_{\text{Jup}}$, $P_{\text{orb}}=3.3$ d. Short-period transiting planet, so an excellent target both for asteroseismology and exoplanet studies.
- **WASP-12** (97.636642, 29.672303, $V=11.69$): G0 star, with a transiting hot Jupiter planet: $1.4 M_{\text{Jup}}$, $1.7 R_{\text{Jup}}$, $P_{\text{orb}}=1.09$ d. It is the one the closest exoplanet to its host star (so, one of the closest to tidal disruption) we know. K2 offers a unique opportunity to observe not only transits but also the whole phase curve of the planet, as well as potential planetary matter falling on the star. So, an **extremely** interesting target both for asteroseismology and exoplanet studies.

We identified in K2 Field 0 an interesting solar-like planet-host, however too faint and late type to yield asteroseismic observations. It nevertheless is a good target for planet studies, which requires **short-cadence observations** given the short orbital period:

- **HAT-P-20** (111.916454, 24.336492, $V=11.34$): K7 star, with a transiting hot Jupiter compact planet: $7.2 M_{\text{Jup}}$, $0.86 R_{\text{Jup}}$, $P_{\text{orb}}=2.87$ d. Short-period transiting planet. Possibility of a second planet in this system (as inferred from TTVs).

Finally, we identified two planet-host subgiant or red giant stars. Both are interesting for asteroseismology and for characterizing the nature of the companion. Given the oscillation periods expected, only **long-cadence observations** are needed:

- **Tau Gem** (107.784877, 30.245162, $V=4.4$): K2 star harboring a massive planet/brown dwarf of $20 M_{\text{Jup}}$ in a 305 d orbital period. No transits discovered.
- **HD59686** (112.951650, 17.086047, $V=5.45$): K2 star harboring a massive planet of $5.25 M_{\text{Jup}}$ in a 303 d orbital period. No transits discovered.